

REMARKS

The Patent Office rejected Claims 1-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 10 and 13 of United States Patent No. 6,166,166 ("the '166 patent"). Additionally, the Patent Office rejected Claims 1-8 and 10-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-2 and 4-8 of United States Patent No. 6,211,324 ("the '324 patent"). Also, the Patent Office rejected Claims 1-11 under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious in view of United States Patent No. 5,589,543 ("Yokelson et al.>").

Additionally, the Patent Office rejected Claims 1-11 under 35 U.S.C. § 102(e) as being anticipated by the '166 patent. The Patent Office also rejected Claims 1-8 and 10-11 under 35 U.S.C. § 102(e) as being anticipated by the '324 patent. Also, the Patent Office rejected Claims 1-2, 4-8 and 10-11 under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 4,741,961 ("Frisch et al.>"). Finally, the Patent Office rejected Claims 1-2, 4, 6 and 8-11 under 35 U.S.C. § 102(b) as being anticipated by the publication entitled "*Tensile Property of Modified Hydroxyl-Terminated Polybutadiene-Based Polyurethanes*" ("Huang et al.>"). These rejections are respectfully traversed.

Summary of the Invention:

The present invention relates to a hydrophobic polyurethane elastomer comprising the reaction product of: a) an isocyanate terminated prepolymer having an isocyanate content ranging from 4 to 12 wt.% NCO comprising the reaction product of i) an OH terminated homopolymer of butadiene and ii) an aliphatic or cycloaliphatic diisocyanate; and b) a diol chain extender. The elastomer of the present invention exhibits excellent mechanical properties.

Rejection of Claims 1-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 10 and 13 of the '166 patent:

The Patent Office rejected Claims 1-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 10 and 13 of

the '166 patent. The Patent Office believes that the Claims of the '166 patent and the subject invention are not patentably distinct from each other because each set of Claims is drawn to a thermoplastic polyurethane derived from a polyisocyanate, an equivalent chain extender, and a hydroxyl terminated polybutadiene.

In an effort to expedite the allowance of this case, Applicants are filing herewith a Terminal Disclaimer in which any term of a patent issuing from this Application which might extend beyond the term of a patent issuing from the commonly owned '166 patent is disclaimed.

The attached Terminal Disclaimer renders this rejection moot. Therefore, Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-11 under the judicially created doctrine of obviousness-type double patenting in view of the '166 patent.

Rejection of Claims 1-8 and 10-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-2 and 4-8 of the '324 patent:

The Patent Office rejected Claims 1-8 and 10-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-2 and 4-8 of the '324 patent. The Patent Office believes that the Claims of the '324 patent and the subject invention are not patentably distinct from each other because each set of Claims is drawn to a thermoplastic polyurethane derived from a polyisocyanate, an equivalent chain extender, and a hydroxyl terminated polybutadiene.

In an effort to expedite the allowance of this case, Applicants are filing herewith a Terminal Disclaimer in which any term of a patent issuing from this Application which might extend beyond the term of a patent issuing from the commonly owned '324 patent is disclaimed.

The attached Terminal Disclaimer renders this rejection moot. Therefore, Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-8 and 10-11 under the judicially created doctrine of obviousness-type double patenting in view of the '324 patent.

Rejection of Claims 1-11 under 35 U.S.C. § 102(b) in view of Yokelson et al.:

Claims 1-11 stand rejected as being anticipated by Yokelson et al. The Patent Office believes that Yokelson et al. disclose the production of hydrophobic polyurethanes derived from the reaction of difunctional polybutadienes having molecular weights which overlap Applicants' diols, with diisocyanates such as isophorone diisocyanate and dicyclohexylmethane diisocyanate, and diol chain extenders. The Patent Office also believes that Yokelson et al. disclose prepolymer techniques. The Patent Office thus concludes that Applicants' prepolymer isocyanate content is inherently met by Yokelson et al.

A retrospective view of inherency is not a substitute for some teaching or suggestion that supports the selection and use of the elements in the particular claimed combination. See In re Newell, 891 F.2d 899, 13 U.S.P.Q.2d 1248, 1250 (Fed. Cir. 1989).

Yokelson et al. may generally disclose that the elastomers of their invention can be prepared by a prepolymer process. See column 3, lines 23-25. However, Yokelson et al. do not provide any examples for preparing an elastomer having improved mechanical properties based on the reaction of a chain extender and an isocyanate terminated prepolymer comprising the reaction product of a hydroxyfunctional polybutadiene ("HFPB") and an aliphatic or cycloaliphatic diisocyanate. Comparison Example 6 of Applicants' claimed invention illustrates the fact that there are no suggestions in Yokelson et al.'s disclosure which support preparing an elastomer having improved physical properties based on the reaction of a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate.

Comparison Example 6 of Applicants' claimed invention generally follows the teachings of Yokelson et al. for preparing an elastomer having improved mechanical properties by a prepolymer process, with one exception. Comparison Example 6 of Applicants' claimed invention uses an isocyanate terminated prepolymer comprising the reaction product of HFPB and 4,4'-diphenylmethane diisocyanate ("MDI"). Yokelson et al. disclose a process for preparing an elastomer using an isocyanate

terminated prepolymer comprising the reaction product of HFPB and toluene diisocyanate ("TDI"). See column 13, line 18. The reaction product of the chain extender and the prepolymer of Comparison Example 6 yields a plaque which, after curing, is opaque, cheesy and breaks into pieces when flexed by hand.

Both TDI and MDI are aromatic diisocyanates. If two aromatic diisocyanates do not perform equally well, why would one skilled in the art expect a completely different type of diisocyanate (i.e., an aliphatic or cycloaliphatic) to have worked well in the Yokelson et al. prepolymer process?

Aliphatic isocyanates are more expensive than aromatic diisocyanates. See Exhibit 1, Encyclopedia of Chemical Technology, Vol. 14, 4th Ed., page 930. As shown by Comparison Example 6 of Applicants' claimed invention, using MDI in lieu of TDI in the prepolymer process of Yokelson et al. does not yield an elastomer having improved physical properties. Clearly, then, no teachings or suggestions can be found in Yokelson et al. which support using any diisocyanate other than TDI in the Yokelson et al. prepolymer process, let alone using a costly aliphatic or cycloaliphatic isocyanate.

Additionally, while Yokelson et al. may suggest a certain olefin, it does not describe or suggest the olefins of Applicants' claimed invention. Therefore, Yokelson et al. would not have motivated the skilled artisan to select the olefins of Applicants' claimed invention. See In re Baird, 29 U.S.P.Q.2d 1550, 1552 (Fed. Cir. 1994) (finding that while the prior art reference suggested certain complex bisphenol A derivatives, it did not describe or suggest bisphenol A and therefore did not motivate the selection of bisphenol A).

Yokelson et al.'s disclosure does not support selecting a chain extender and reacting it with an isocyanate terminated prepolymer comprising the reaction product of HFPB and a costly aliphatic or cycloaliphatic diisocyanate for the production of elastomers having improved physical properties. Yokelson et al., therefore, do not anticipate Applicants' claimed invention. Thus, Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-11 under 35 U.S.C. § 102(b) in view of Yokelson et al.

Rejection of Claims 1-11 under 35 U.S.C. § 103(a) in view of Yokelson et al.:

The Patent Office believes that Yokelson et al. disclose the use of cycloaliphatic diisocyanates to produce polyurethanes. The Patent Office takes the position that one having ordinary skill in the art, seeking light stable polyurethanes, would have been motivated to utilize the cycloaliphatic diisocyanates of Yokelson et al. since it has long been established that polyurethanes derived from non-aromatic diisocyanates possess superior light stability properties as compared to polymers derived from aromatic isocyanates.

The criterion for determining obviousness is whether the prior art would have suggested to one of ordinary skill in the art that Applicants' process should have been carried out and would have had a reasonable likelihood of success. See In re Dow Chemical Co., 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988). Both the suggestion and the expectation of success must be found in the prior art, not in Applicants' disclosure. Id.

The disclosure in Yokelson et al. would not have suggested to one skilled in the art the preparation of elastomers by reacting a chain extender with an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate such as dicyclohexylmethane diisocyanate ("rMDI"). Additionally, one skilled in the art, armed with the knowledge gained from Yokelson et al.'s disclosure, would not have expected that an elastomer having improved physical properties could have been successfully prepared by reacting a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate such as rMDI.

Yokelson et al. disclose a polyurethane elastomer comprising the reaction product of a polyol, an isocyanate and a chain extender. Yokelson et al. further disclose that the isocyanate can be an aromatic or an aliphatic or a cycloaliphatic isocyanate. See Claim 11. Example 2 of Yokelson et al. describes the production of their polyurethane elastomer using a prepolymer process. In this Example, however, the isocyanate terminated prepolymer comprises the reaction product of HFPB and TDI.

As mentioned above, aliphatic isocyanates are more expensive than aromatic diisocyanates. See Exhibit 1. Additionally, aliphatic diisocyanates were used mainly in coatings and in only very special cast systems. See Exhibit 2, Oertel, *Polyurethane Handbook*, 1985, pages 14 and 374. Also, Yokelson et al. freely admit that “. . . the **final physical properties** of the elastomers of the [this] invention may be **altered considerably by altering the identity . . . of the species reacted.**” See Yokelson et al., column 3, lines 57-60.

Taking into consideration the fact that aliphatic diisocyanates are more costly than aromatic isocyanates, and the fact that aliphatic diisocyanates were typically only used in coatings and in very special cast systems and, finally, the fact that Yokelson et al. themselves admit that the use of an aliphatic or cycloaliphatic diisocyanate in lieu of an aromatic isocyanate could considerably alter the physical properties of the resulting elastomer, it is clearly seen that there would have been no suggestion to one skilled in the art that elastomers having improved physical properties could have been prepared by reacting a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic isocyanate.

More importantly, from the disclosure of Yokelson et al., one skilled in the art would not have expected that an elastomer having improved physical properties could have been **successfully** prepared by reacting a chain extender with an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate such as rMDI. In fact, one skilled in the art would have expected to have nothing but problems with preparing an elastomer by reacting a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate such as rMDI. The disclosure of Yokelson et al. then actually teaches away from Applicants' claimed invention. A reference may be said to teach away if it suggests to one having ordinary skill in the art that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the Applicant. See Tec Air, Inc. v. Denso Manufacturing Michigan Inc., 192 F.3d 1353,

1360, 52 U.S.P.Q.2d 1294 (Fed. Cir. 1999) *quoting In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q.2d 1130, 1131 (Fed. Cir. 1994).

As mentioned above, aliphatic diisocyanates are more expensive than aromatic isocyanates. See Exhibit 1. Given the foregoing, if one having ordinary skill in the art would have attempted to prepare an elastomer pursuant to the prepolymer process disclosed by Yokelson et al. utilizing another diisocyanate in lieu of TDI, he would have certainly used MDI in the process **before** utilizing rMDI in the process. As shown by Comparison Example 6 of Applicants' claimed invention, the reaction of a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and MDI produces an undesirable and unusable elastomer. See the Application, page 10, lines 1-2.

Given the results of Comparison Example 6, one skilled in the art, knowing that an elastomer having improved mechanical properties could not have been produced by reacting a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and MDI, certainly would have expected that an elastomer having improved physical properties could only be prepared with the prepolymer process of Yokelson et al. **if TDI is used as the diisocyanate.**

A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. See In re Rijckaert, 9 F.3d 1531, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). Applicants claimed invention is not obvious in view of Yokelson et al. because, as mentioned above, the disclosure of Yokelson et al. would have suggested to the skilled artisan **not** to react a chain extender with an isocyanate terminated prepolymer comprising HFPB and an aliphatic or cycloaliphatic diisocyanates in the preparation of elastomers having improved mechanical properties.

Given the foregoing, Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-11 under 35 U.S.C. §103 in view of Yokelson et al.

Rejection of Claims 1-11 under 35 U.S.C. § 102(e) in view of the '166 patent:

The Patent Office rejected Claims 1-11 under 35 U.S.C. § 102(e) in view of the '166 patent. The Patent Office believes that the '166 patent discloses the production of polyurethanes from aliphatic or cycloaliphatic diisocyanates, chain extenders and polyols.

A reference anticipates a claim if it discloses the claimed invention such that a skilled artisan could take its teaching in combination with his own knowledge of the particular art and be in possession of the invention. See In re Graves, 69 F.3d 1147, 36 U.S.P.Q.2d 1697, 1701 (Fed. Cir. 1995).

The '166 patent discloses a process for improving the mechanical properties of an elastomer obtained by not only curing but also by extruding a casting composition of an elastomer, the process comprising: a) providing an elastomer comprising the reaction product of a prepolymer and a diol chain extender, the prepolymer comprising the reaction product of a HFPB and an aromatic diisocyanate; b) chain extending the prepolymer with 1,4-butanediol to form a casting composition; c) improving the poor physical properties of the polyurethane obtained by reacting the chain extender with the isocyanate terminated prepolymer which comprises the reaction product of HFPB and an aromatic diisocyanate (such as MDI) by extruding the casting composition to form at least one strand of a polyurethane elastomer; d) pelleting the at least one strand of polyurethane elastomer to form at least one pellet; and e) processing the at least one pellet to form a thermoplastic polyurethane material. See '166 patent, column 4, lines 10-15 and 64- 65; Table 3.

The '166 patent discloses that a polyurethane based on a chain extender reacted with an isocyanate terminated prepolymer comprising the reaction product of HFPB and MDI has **poor physical properties**. See column 4, line 64. This result is also illustrated in Comparison Example 6 of Applicants' claimed invention.

Comparison Example 6 of Applicants' claimed invention describes an elastomer based on a chain extender reacted with an isocyanate terminated prepolymer comprising the reaction product of HFPB and MDI. This reaction

produces a plaque which is opaque, cheesy and breaks into pieces when flexed by hand. See the Application, page 10, lines 1-2.

Applicants' claimed invention, on the other hand, is directed to an elastomer based on a chain extender reacted with an isocyanate terminated prepolymer comprising the reaction product of HFPB and a cycloaliphatic or aliphatic diisocyanate. This reaction produces a plaque which has excellent mechanical properties. See Application, pages 7-8, Example 4.

Again, it is important to note that aliphatic isocyanates are more expensive than aromatic diisocyanates. See Exhibit 1. The skilled artisan, realizing from the '166 patent that an elastomer produced from the reaction of a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and MDI has poor physical properties, and also realizing that aliphatic or cycloaliphatic diisocyanates are more costly than aromatic diisocyanates, would not have prepared an elastomer based on the reaction of a chain extender and an isocyanate terminated prepolymer comprising the reaction product of HFPB and an aliphatic or cycloaliphatic diisocyanate.

If the skilled artisan had wanted to obtain an elastomer having improved physical properties by reacting a chain extender with an isocyanate terminated prepolymer comprising the reaction product of HFPB and a diisocyanate, but at the same time he wanted to avoid practicing the extrusion step of the '166 patent, he would have simply reverted back to using the prepolymer process of Yokelson et al. As discussed above, the skilled artisan would have only used **TDI** as the diisocyanate in Yokelson et al.'s prepolymer process.

The skilled artisan, therefore, would not have been in possession of Applicant's claimed invention. Thus, Applicants' claimed invention is not anticipated by the '166 patent. Applicants, therefore, respectfully request that the Patent Office withdraw its rejection of Claims 1-11 under 35 U.S.C. § 102(e) in view of the '166 patent.

Notwithstanding the foregoing, in an effort to expedite the allowance of this case, Applicants are filing herewith a Declaration Under 37 C.F.R. § 1.131.

Rejection of Claims 1-8 and 10-11 under 35 U.S.C. § 102(e) in view of the '324 patent:

The Patent Office rejected Claims 1-8 and 10-11 under 35 U.S.C. § 102(e) in view of the '324 patent. The Patent Office believes that the '324 patent discloses the production of polyurethanes from aliphatic or cycloaliphatic diisocyanates, chain extenders and polyols.

The claimed invention must be the same as that described in the reference in order for the reference to anticipate. See Glaverbel Societe Anonyme v. Northlake Marketing & Supply Inc., 33 U.S.P.Q.2d 1496, 1498 (Fed. Cir. 1995).

The '324 patent discloses an elastomer based on a chain extender reacted with an isocyanate terminated prepolymer comprising the reaction product of HFPB and from 10 to 70 percent by weight of an isocyanate. The chain extender of the '324 patent, however, is an asymmetric diol chain extender having a molecular weight ranging from 75 to 200. See column 2, line 41.

The '324 patent requires the use of an asymmetric diol chain extender such as 2,2,4-trimethylpentane-1,3-diol (TMPD) to produce a useable elastomer. As shown by Comparison Examples 4 and 9 of the '324 patent, the use of a diol chain extender with a plane of symmetry such as 1,4-butanediol in the '324 patent yields an undesirable and/or unusable elastomer. Applicants' claimed invention, on the other hand, is not limited to asymmetric diol chain extenders.

Considering the foregoing, it is clear that Applicants' claimed invention is not the same as the invention described in the '324 patent. Thus, the '324 patent cannot anticipate Applicants' claimed invention. Applicants, therefore, respectfully request that the Patent Office withdraw its rejection of Claims 1-8 and 10-11 under 35 U.S.C. § 102(e) in view of the '324 patent.

Notwithstanding the foregoing, in an effort to expedite the allowance of this case, Applicants are filing herewith a Declaration Under 37 C.F.R. § 1.131.

Rejection of Claims 1-2, 4-8 and 10-11 under 35 U.S.C. § 102(b) in view of Frisch et al.:

The Patent Office rejected Claims 1-2, 4-8 and 10-11 under 35 U.S.C. § 102(b) in view of Frisch et al. The Patent Office believes that Frisch et al. disclose a polyurethane elastomer derived from the reaction of a cycloaliphatic diisocyanate with a polybutadiene diol and a diol chain extender.

A 102(b) reference must sufficiently describe the claimed invention to have placed the public in possession of it. See Paperless Accounting, Inc. v. Bay Area Rapid Transit System, 804 F.2d 659, 231 U.S.P.Q. 649, 653 (Fed. Cir. 1986). Frisch et al. generally disclose a polybutadiene diol. However, nowhere in Frisch et al. are there any details regarding the polybutadiene diol. Applicants' claimed invention, on the other hand, discloses using OH terminated homopolymers of butadiene having a functionality ranging from 1.9 to 2.1, preferably 1.95 to 2.0. See the Application, page 4, line 2. Conventional commercial polybutadiene polyols have a functionality from 2.4 to 2.6. See the '543 patent, column 6, lines 38-39.

Additionally, Applicants disclose that examples of suitable OH terminated homopolymers of butadiene useful in their invention are represented by the formula $\text{HO}[\text{CH}_2\text{-CH=CH}(\text{CH}_2)_2\text{-CH=CH-CH}_2]_n\text{CH}_2\text{-CH=CH-CH}_2\text{OH}$, wherein n is a number average value from about 8 to 36. See the Application, page 4, lines 6-7. Conventional commercial polybutadiene polyols can contain 1,2-type repeat units and, as a result, a significant fraction of pendant vinyl groups. See the '543 patent, column 6, lines 38-41.

Considering the foregoing, it is clear that Frisch et al. do not sufficiently describe Applicants' claimed invention so as to have placed the public in possession of it. Frisch et al, therefore, do not anticipate Applicants' claimed invention. Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-2, 4-8 and 10-11 under 35 U.S.C. § 102(b) in view of Frisch et al.

Rejection of Claims 1-2, 4, 6 and 8-11 under 35 U.S.C. § 102(b) in view of Huang et al.:

The Patent Office rejected Claims 1-2, 4, 6 and 8-11 under 35 U.S.C. § 102(b) in view of Huang et al. The Patent Office believes that Huang et al. disclose a polyurethane elastomeric composition derived from the reaction of rMDI with a polybutadiene diol and 1,4-butanediol.

As mentioned above, a 102(b) reference must sufficiently describe the claimed invention to have placed the public in possession of it. Id.

Huang et al. disclose using, as the HFPB, R-45M from Arco Co. See Huang et al., page 1236. R-45M has a functionality between 2.2 - 2.4. See Exhibit 3, United States Patent No. 5,688,598, column 8, line 59. Applicants' claimed invention, on the other hand, discloses using an HFPB having a functionality ranging from 1.9 to 2.1, preferably, from 1.95 to 2.0. See the Application, page 4, line 2.

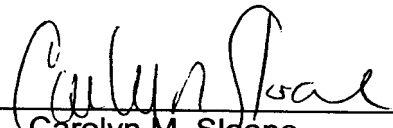
Considering the foregoing, it is clear that Huang et al. do not sufficiently describe Applicants' claimed invention so as to have placed the public in possession of it. Huang et al, therefore, do not anticipate Applicants' claimed invention. Applicants respectfully request that the Patent Office withdraw its rejection of Claims 1-2, 4, 6 and 8-11 under 35 U.S.C. § 102(b) in view of Huang et al.

CONCLUSION

For the foregoing reasons, Applicants respectfully request: that the terminal disclaimer be entered; that the rejection of Claims 1-11 under the doctrine of obviousness-type double patenting in view of the '166 patent be withdrawn; that the rejection of Claims 1-8 and 10-11 under the doctrine of obviousness-type double patenting in view of the '324 patent be withdrawn; that the rejection of Claims 1-11 under 35 U.S.C. § 102(b) in view of Yokelson et al. be withdrawn; that the rejection of Claims 1-11 under 35 U.S.C. § 103(a) in view of Yokelson et al. be withdrawn; that the rejection of Claims 1-11 under 35 U.S.C. § 102(e) in view of the '166 patent be withdrawn; that the rejection of Claims 1-8 and 10-11 under 35 U.S.C. § 102(e) in view of the '324 patent be withdrawn; that the rejection of Claims 1-2, 4-8 and 10-11

under 35 U.S.C. § 102(b) in view of Frisch et al. be withdrawn; that the rejection of Claims 1-2, 4, 6 and 8-11 under 35 U.S.C. § 102(b) in view of Huang et al. be withdrawn; and that pending Claims 1-11 be allowed to issue as a U.S. patent.

Respectfully submitted,

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